US009268442B1

(12) **United States Patent**
Hobbs

(10) **Patent No.: US 9,268,442 B1**
(45) **Date of Patent: Feb. 23, 2016**

(54) **APPARATUS AND METHOD FOR RECEIVING INPUT**

(71) Applicant: **Google Inc.**, Mountain View, CA (US)

(72) Inventor: **Nicholas Kenneth Hobbs**, San Francisco, CA (US)

(73) Assignee: **Google Inc.**, Mountain View, CA (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 92 days.

(21) Appl. No.: **13/737,427**

(22) Filed: **Jan. 9, 2013**

(51) **Int. Cl.**

G06F 3/041	(2006.01)
G06F 3/045	(2006.01)
G06F 5/00	(2006.01)
G06F 3/044	(2006.01)

(52) **U.S. Cl.**
CPC ***G06F 3/044*** (2013.01)

(58) **Field of Classification Search**
CPC G06F 3/044
USPC 345/156, 173, 174
See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

3,898,421	A *	8/1975	Suzumura	200/517
5,508,703	A *	4/1996	Okamura et al.	341/176
5,850,213	A *	12/1998	Imai et al.	428/1.55
5,912,612	A *	6/1999	DeVolpi	338/95
7,310,083	B2 *	12/2007	Hagiwara et al.	345/156
8,237,593	B2 *	8/2012	Oh	341/22
2002/0110237	A1 *	8/2002	Krishnan	379/419
2005/0030292	A1 *	2/2005	Diederiks	345/173
2006/0017585	A1 *	1/2006	Lenneman	B60K 35/00 340/691.6
2006/0028454	A1	2/2006	Branton et al.	
2007/0069914	A1 *	3/2007	Lenneman	B60K 35/00 340/691.6
2008/0122794	A1	5/2008	Koiso	
2008/0211779	A1 *	9/2008	Pryor	G01C 21/3664 345/173
2008/0291169	A1 *	11/2008	Brenner et al.	345/168
2008/0293274	A1 *	11/2008	Milan	H01R 27/00 439/171
2008/0303796	A1 *	12/2008	Fyke	345/173
2009/0085880	A1	4/2009	Vitale et al.	
2009/0197059	A1 *	8/2009	Weber et al.	428/201
2009/0237371	A1	9/2009	Kim et al.	
2009/0319893	A1	12/2009	Pihlaja	
2010/0103127	A1	4/2010	Park et al.	
2010/0162109	A1 *	6/2010	Chatterjee et al.	715/702
2011/0286676	A1	11/2011	El Dokor	
2011/0316785	A1	12/2011	Hidary	
2013/0009900	A1	1/2013	Pryor	

FOREIGN PATENT DOCUMENTS

DE	102009052928	A1	5/2011

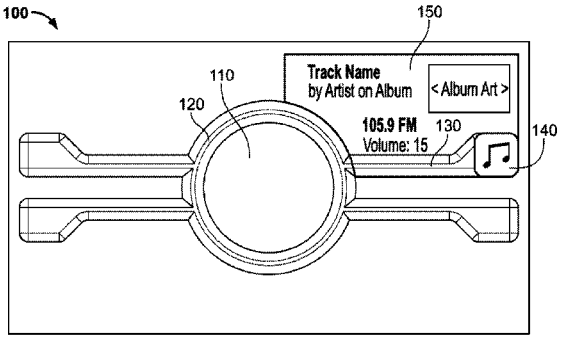
* cited by examiner

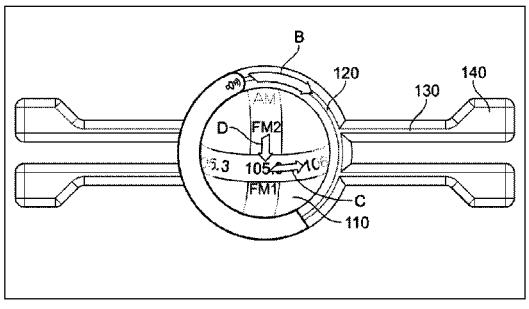
Primary Examiner — Temesh Ghebretinsae
Assistant Examiner — Benyam Ketema
(74) *Attorney, Agent, or Firm* — Lerner, David, Littenberg, Krumholz & Mentlik, LLP

(57) **ABSTRACT**

According to aspects of the disclosure, an input device may include a first adjustment region, a second adjustment region, a connector region, a function region, and a display region. In one example, a user may access a particular function by providing a gesture to the function region. The user may then continue the gesture from the function region to the connector region for a predetermined length along the connector region. Once a particular function is accessed, a user may control the parameters or settings associated with that particular function via one or both of the first adjustment region and second adjustment region. For example, a user may provide a gesture to either the first or second adjustment region in order to modify parameters associated with the function.

29 Claims, 4 Drawing Sheets





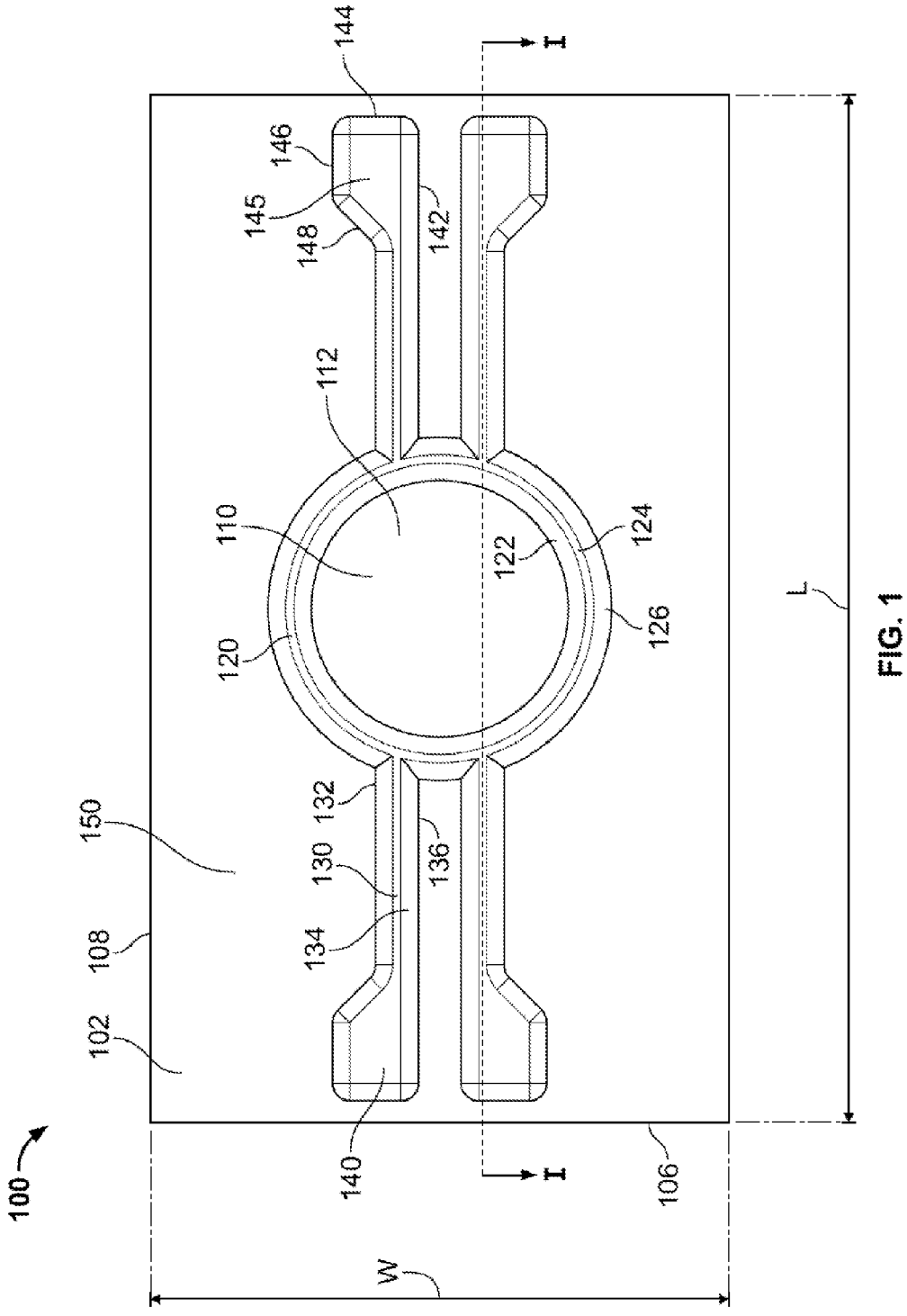

144
I
146
145
148
142
112
110
124
122
126
120
L
132
150
130
136
134
108
102
100
140
I
106
W

FIG. 1

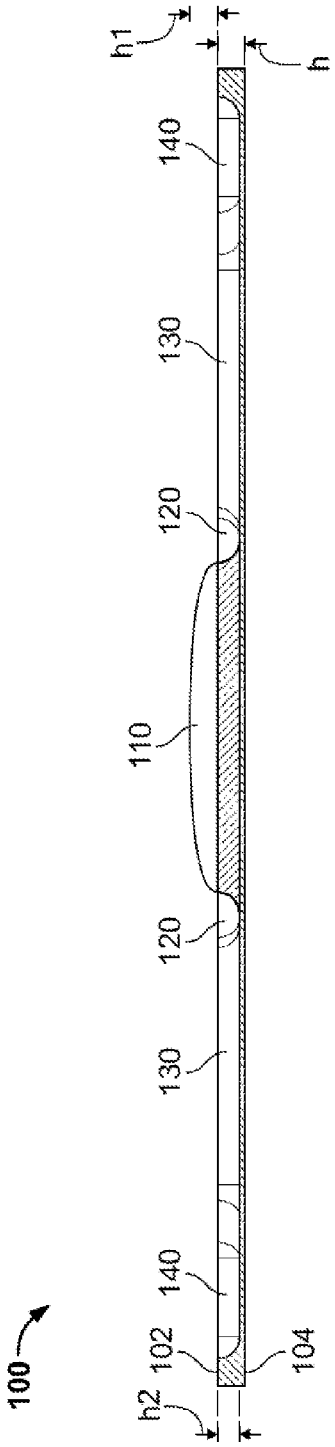

h1
h
140
130
120
110
120
130
140
102
104
h2
100

FIG. 2

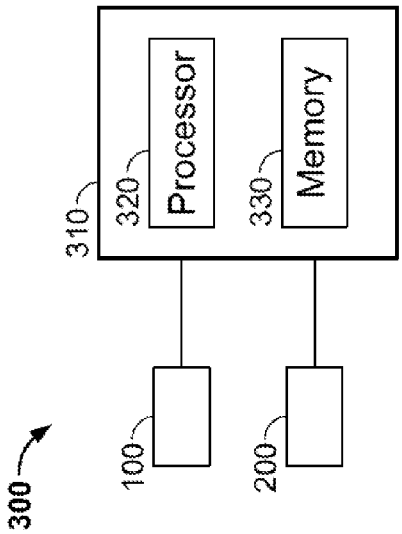

300
310
320
Processor
330
Memory
100
200

FIG. 3

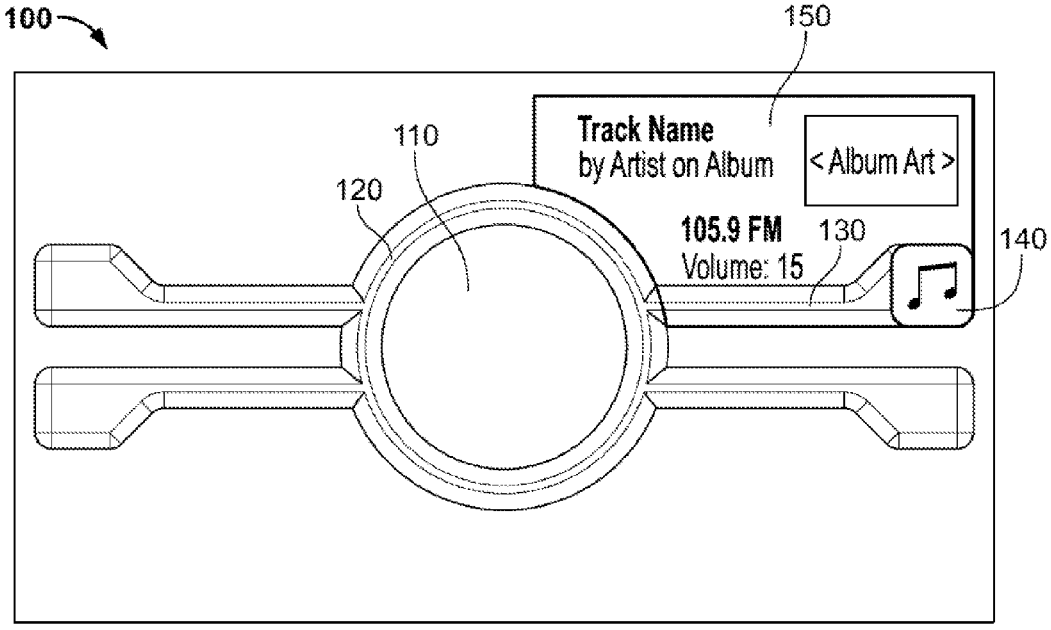

100
150
Track Name
by Artist on Album
< Album Art >
110
120
105.9 FM
Volume: 15
130
140

FIG. 4

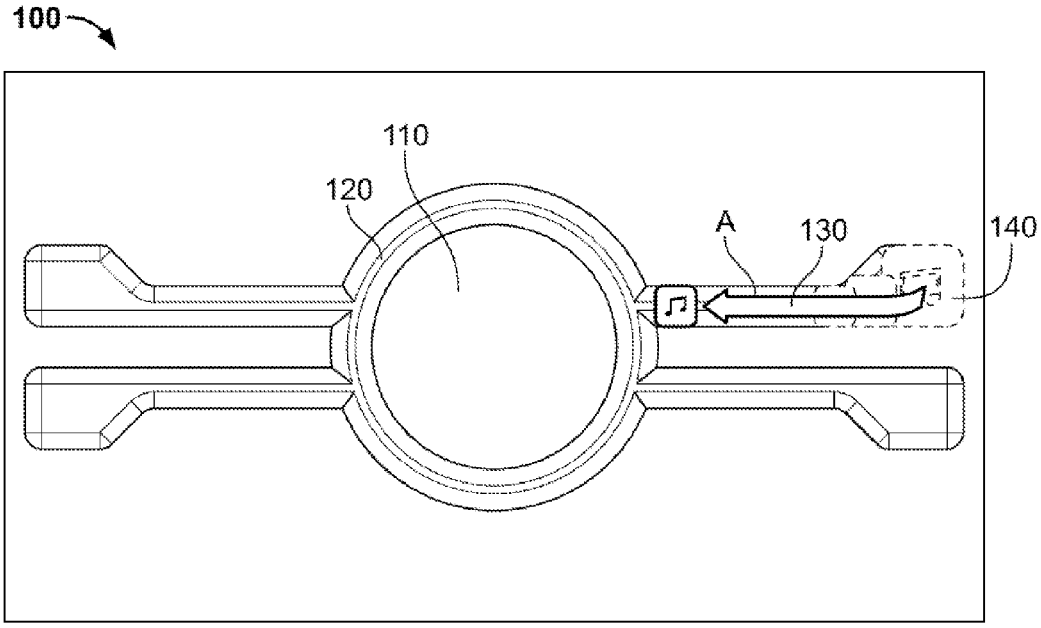

100
110
120
A
130
140

FIG. 5

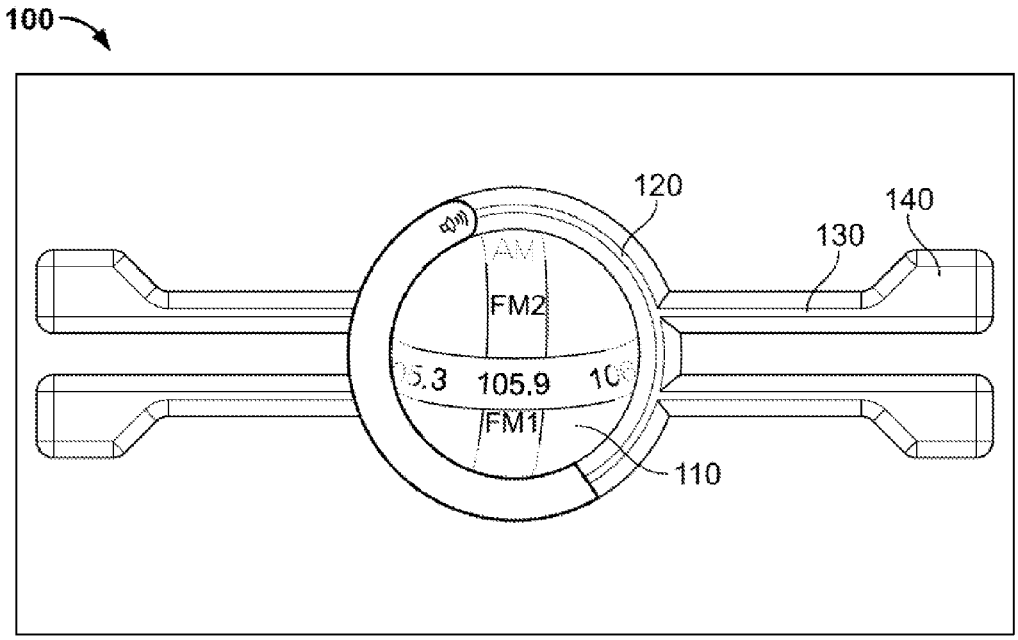

100
120
140
130
AM
FM2
105.9
FM1
110

FIG. 6

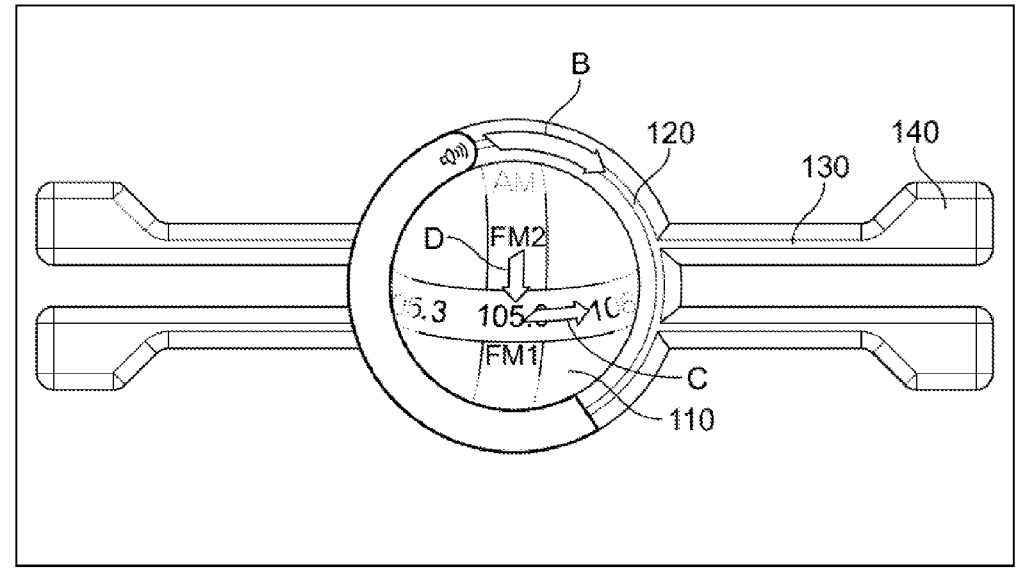

B
120
140
130
AM
D
FM2
105.3
FM1
C
110

FIG. 7

APPARATUS AND METHOD FOR RECEIVING INPUT

BACKGROUND

In certain conventional touchscreen devices, the touchscreens are generally intuitive in that the gestures of a user generally correspond to the associated function being performed. Additionally, touch screens provide direct visual feedback by changing the visual elements the user's gestures are interacting with on the screen. However, this requires a user to look at the touchscreen in order to correctly perform the gesture. In certain other user interfaces, the control input (for example a track pad, mouse, scroll wheel, joystick, etc.) may be located away from the display module. In this regard, the controls may be difficult to learn and may lack the correspondence provided in other conventional touchscreens.

BRIEF SUMMARY

One aspect of the disclosure provides a system, including a user input device including a first input surface configured to receive user input, the first input surface disposed on a first side of the input device; a second input surface configured to receive user input, the second input surface disposed on the first side of the input device; and a display device disposed adjacent a second side of the user input device, the display device being disposed at a first distance from the first input surface and at a second distance from the second input surface, with the first distance being different from the second distance.

In one example, the user input device is substantially transparent.

In one example, the user input device further includes a display surface disposed on the first side, the display surface being disposed a third distance from the display device, the third distance being between the first and second distance.

In one example, the user input device further includes a third input surface configured to receive user input, the third input surface disposed on the first side of the input device and being disposed at a distance from the display device equal to the second distance.

In one example, the third input surface further includes a plurality of third input surfaces.

In one example, the first input surface is circular.

In one example, the first input surface is convex with respect to the second side.

In one example, the first input surface is configured to receive at least one of a horizontal swipe, vertical swipe and tap.

In one example, the second input is a circular ring.

In one example, the second input surface surrounds the first input surface.

In one example, the second input is recessed with respect to the first side of the input device.

Another aspect of the disclosure provides a user input device having a first side and a second side, including a first input surface configured to receive user input, the first input surface disposed on the first side and having a first height with respect to the second side; a second input surface configured to receive user input, the second input surface disposed on the first side of the user input device and having a second height with respect to the second side; a substantially transparent display surface disposed on the first side of the input device configured to display a graphic, the display surface having a third height with respect to the second side that is less than the first height and greater than the second height.

In one example, the user input device further includes a third input surface configured to receive a third user input, the third input surface disposed on the first side of the input device and having a height with respect to the second side that is equal to the second input surface.

In one example, the third input surface further comprises a plurality of third input surfaces.

In one example, the first input surface is circular.

In one example, the first input surface is convex with respect to the second side.

In one example, the first input surface is configured to receive a horizontal swipe, vertical swipe or tap.

In one example, the second input is a circular ring.

In one example, the second input surface surrounds the first input surface.

In one example, the second input is recessed with respect to the first side of the input device.

Another aspect of the disclosure provides a method of receiving input, including receiving a first user input at a first input surface, the first input surface being disposed on a first side of a user input device and having a first height with respect to a second side of the user input device; and receiving a second user input at a second input surface, the second user input being disposed on the first side of the user input device and having a second height with respect to the second side of the user input device, the second height being different from the first height.

In one example, the first user input comprises at least one of a horizontal swipe, a vertical swipe, or a tap.

In one example, the second user input comprises a circular swipe.

Another aspect of the disclosure provides a system including: a display; a substantially transparent input device overlaying the display; the input device comprising a surface and an output, the output providing signals indicative of a location at which the surface was touched and the surface including: a first touch sensitive portion, a second touch sensitive portion disposed farther from the display than the first touch sensitive portion, and a transition portion disposed between the first touch sensitive portion and the second touch sensitive portion, the transition portion being configured to be perceptibly distinguishable, based on human touch, from the first and second touch sensitive portions.

In one example, the system may further include a processor, a memory accessible by the processor and instructions stored in the memory and accessible by the processor, wherein the instructions include: displaying on the display a first visual feature corresponding with a first function at a location corresponding with the first touch sensitive portion, displaying on the display a second visual feature corresponding with a different function at a location corresponding with the second touch sensitive portion, and performing the first function when the output indicates that the first touch sensitive portion was touched and the second function when the output indicates that the second touch sensitive portion was touched.

In one example, edges of the input device lie substantially within the same plane.

In one example, a shape of the transition portion relative to the plane is a curve.

In one example, the shape is a circle.

In one example, a cross section of the transition portion, relative to a plane orthogonal to the plane of the display edges, is at least partially curved.

In one example, the input device is configured to output data indicative of a swipe gesture, wherein the first touch sensitive portion is configured to receive a swipe gesture

without touching the second touch sensitive portion, and wherein the second touch sensitive portion is configured to receive a swipe gesture without touching the first touch sensitive portion.

In one example, the transition portion is touch sensitive and the output indicates when the transition portion was touched.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a top view of an input device according to one aspect of the disclosure;

FIG. **2** is a cross-sectional view of the input device of FIG. **1** along the line I-I.

FIG. **3** is a block diagram of a system

FIG. **4** is top view of a device for receiving input according to a another aspect of the disclosure;

FIG. **5** is top view of a device for receiving input of FIG. **4**;

FIG. **6** is top view of a device for receiving input of FIG. **4**;

FIG. **7** is top view of a device for receiving input of FIG. **4**.

DETAILED DESCRIPTION

According to aspects of the disclosure, an input device **100** may include a first adjustment region **110**, a second adjustment region **120**, a connector region **130**, a function region **140**, and a display region **150**. In one example, a user may access a particular function by providing a gesture to the function region **140**. The user may then continue the gesture from the function region **140** to the connector region **130** for a predetermined length along the connector region **130**. Once a particular function is accessed, a user may control the parameters or settings associated with that particular function via one or both of the first adjustment region and second adjustment region. For example, a user may provide a gesture to either the first or second adjustment region in order to modify parameters associated with the function.

FIG. **1** is a top view of an input device according to one aspect of the disclosure, while FIG. **2** is a cross-sectional view of the input device of FIG. **1** along the line I-I. In the example of FIGS. **1** and **2**, the input device **100** may be substantially parallelepiped in shape. In this regard, the input device **100** may include a top surface **102**, a bottom surface **104**, and sides **106** and **108**. In other examples, the input device **100** may have a different shape. For example, the input device **100** may be substantially circular or any other three-dimensional shape, such as a polygon, oval, etc.

The device **100** may have any dimensions. In this example, the device **100** may have a length l along side **108** of approximately 8 inches, e.g., 8 inches +/−1 inch, a width w along side **106** of approximately 4 inches, e.g., 4 inches +/−1 inch, and a height h of approximately ½ inch, e.g., ½ inch +/−¼ inch. The height h may represent a height of an overall planar surface of the device **100**, e.g., a height h as measured between a top surface **102** and a bottom surface **104** of the input device **100** at one of the sides **106**, **108** of the device **100**. However, certain regions of the device **100**, such as regions formed at the top surface **102**, may have a height greater or less than the height h, which will be explained in greater detail below.

The device **100** may be formed of any material, including, for example, one or more of plastic, glass, or any other materials capable of receiving tactile input. For example, the device **100** may be capable of detecting tactile inputs from a user, such as gestures in the form of taps, swipes, and the like. In this regard, the device **100**, or portions thereof, may be any type of interface capable of detecting tactile input, such as a resistive, surface acoustic wave, or capacitive interface. In another example, the device **100** may be formed of a material not capable of receiving tactile input. In yet another example, the device may be capable of receiving tactile input at certain regions but not at others. In yet another example, the device **100** may be a composition or combination or multiple materials, such as any of the materials discussed above. According to one aspect of the disclosure, the device **100**, or portions thereof, may be substantially transparent to allow a user to see therethrough.

The device **100** may include a first adjustment region **110**. The first adjustment region **110** may be a generally circular or other shaped region and may be configured to receive an input from a user. In this regard, the first adjustment region **110**, or at least a portion thereof, may be capable of receiving tactile input from a user at an input surface **112**. The input from a user may be, for example, any type of tactile input, such as any type of gesture including a tap, swipe, or the like. The input surface **112** may be convexly curved with respect to the top surface **102** of the device **100**. In this regard, as shown in FIG. **2**, the surface **112** may extend above the top surface **102** by a height h**1**. The height h**1** may be any height, and in one example may be approximately 0.5 cm, e.g., 0.5 cm +/−0.1 cm.

The device **100** may also include a second adjustment region **120** for receiving a second input. The second adjustment region **120** may surround the first adjustment region **110**. In this regard, the second adjustment region **120** may be in the shape of a ring or any other shape which may be substantially concentric or otherwise surrounds, complements or follows the shape of the first adjustment region **110**. The second adjustment region **120** may have an inner sidewall **122**, an input surface **124**, and an outer sidewall **126**. The inner sidewall **122** may be a continuously formed wall that extends between the input surface **124** of the second adjustment region **120** and the input surface **112** of the first adjustment region **110**. The inner sidewall **122** and the input surface **124** of the second adjustment region **120** may adjoin by way of a curved edge surface, or alternatively, at a predetermined angle. In the same way, the inner sidewall **122** and the input surface **112** of the first adjustment region **110** may adjoin by way of a curved edge surface, or alternatively, at a predetermined angle. In this regard, a transition between the input surface **124** of the second adjustment region and the input surface **112** of the first adjustment region may be perceptible to a human solely by touch, thereby allowing a human to distinguish between the input surfaces **112** and **124** based solely on touch.

The input surface **124** may have a continuously curved cross-section, as seen in the example FIG. **2**, and may be configured to receive input from a user. The input surface **124** may be capable of receiving tactile input, such as a gesture including a tap, swipe, or the like. The surface **124** may also be concave with respect to the top surface **102** of the device **100**. For example, the surface **124** may be a ring-shaped channel formed in the device **100**. In this regard, the input surface **124** may extend a distance h**2** below the top surface **102** device **100**. The height h**2** may be any height, and in one example is approximately 0.5 cm, e.g., 0.5 cm +/−0.1 cm.

The outer sidewall **126** may include a curved surface concentrically arranged with respect to the inner sidewall **122**. The outer sidewall **126** may be discontinuously formed in the sense that the sidewall **126** may be interrupted by one or more connector regions **130**, as will be explained in greater detail below. The sidewall **126** may extend from the input surface **124** to the top surface **102** and may join the two either by a curved surface or at predetermined angles.

Each of the first and second adjustment regions **110** and **120** may be sized and shaped to provide visual feedback to a user regarding a type of gesture input may be processed as an input command at the region. For example, a user may intuitively determine, based on the shape of the first and second adjustment regions **110** and **120**, that the second adjustment region **120** may accept and process a circular swipe input, either with one finger or with multiple fingers. In another example, gesture input provided to one of the adjustment regions **110** and **120** may not be extended to result in an input at the other of the adjustment regions **110** and **120**. This may be accomplished by virtue of the height differences between the two regions, or alternatively, by a processor connected to the input device **100**, as will be described in greater detail below.

The device **100** may also include a connector region **130** and a function region **140**. According to some aspects of the disclosure, the device **100** may include a plurality of connector sub-regions **130** and function sub-regions **140**. In this example, each connector sub-region **130** may correspond to a respective function sub-region **140**. It is contemplated that the device **100** may include any number of connector regions or sub-regions **130** and function regions or sub-regions **140**.

The connector region **130** may include sidewalls **132** and **136** and an input surface **134**. Each of the sidewalls **132**, **136** may extend between the input surface **134** and the top surface **102** of the device **100**. In this regard, the sidewalls **132**, **136** may be curved surfaces or may adjoin the adjacent input surface **134** and top surface **102** at a predetermined angle. The sidewalls **132** and **136** may extend in a generally parallel fashion between the function region **140** and the second adjustment region **120**. The input surface **134** may be capable of receiving tactile input from a user, such as a gesture including a tap, swipe, or the like. The input surface **134** has a generally curved cross section in a direction perpendicular to the sidewalls **132**, **136**.

In the example of FIG. **1**, the function region **140** may include a plurality of sidewalls **142**, **144**, **146**, **148** as well as an input surface **145**. The sidewall **142** may be parallel to the sidewalls **132** and **136**, and may extend between one of the sidewalls **132**, **136** and the sidewall **144**. Similarly, the sidewall **146** may be parallel to the sidewalls **132** and **136**, and may extend between the sidewall **148** and sidewall **144**. The sidewall **144** may be perpendicular to the sidewalls **142** and **146**, while the sidewall **148** may be disposed at approximately a 45 degree angle with respect to the sidewall **146**. Each of the sidewalls **142-148** may extend between the input surface **145** and the top surface **102**, and may be curved or may form an angle with each. The input surface **145** may be substantially flat and may be capable of receiving tactile input from a user.

The first adjustment region **110**, second adjustment region **120**, connector region **130** and function region **140** may each have a shape that corresponds to one or more types of user inputs. For example, each of the regions **110-140** may include respective input surfaces that correspond to a particular type of gesture input. In this regard, input surface **112** may correspond to a left-to-right (horizontal) or up-to-down (vertical) swipe input gesture, or alternatively may correspond to a tap input gesture. Input surface **124** may correspond to a circular swipe input gesture. Input surfaces **134** may correspond to a linear swipe input gesture.

The device **100** may also include a display region **150**. The display region **150** may correspond to a respective connector region **130** and function region **140**. In this regard, the input device **100** may include a plurality of display sub-regions **150**, each of which correspond to a respective connector sub-region **130** and a function sub-region **150**. In one example, the display region **150** may be a substantially flat region on the top surface **102** of the device **100**. In this regard, the display region may be defined as the region bordered by the corresponding connector region **130**, the corresponding function region **140**, the second adjustment region **120**, an adjacent display region **150**, and the sides **106** and **108** of the device **100**. The display region **150** may have a height that is substantially equal to the height h of the device **100**. In one example, each of the display sub-regions **150** may accept gesture input, such as a tap, swipe, or the like.

FIG. **3** is a block diagram of a system **300** according to aspects of the disclosure. As shown in FIG. **3**, a system **300** in accordance with one aspect of the disclosure includes a computer **310** containing a processor **320**, memory **330** and other components typically present in general purpose computers. In this example, the input device **100** may be communicatively coupled to the computer **300**. In addition, a display device **200** may be communicatively coupled to the processor **300**. In one example, the input device **100** and the display device **200** may be physically and/or communicatively coupled to one another.

The memory **330** may store information accessible by processor **320**, including instructions that may be executed by the processor **120** and data. The memory **330** may be of any type capable of storing information accessible by the processor, including a computer-readable medium, or other medium that stores data that may be read with the aid of an electronic device, such as a hard-drive, memory card, ROM, RAM, DVD or other optical disks, as well as other write-capable and read-only memories. The system and method may include different combinations of the foregoing, whereby different portions of the instructions and data are stored on different types of media.

The instructions may be any set of instructions to be executed directly (such as machine code) or indirectly (such as scripts) by the processor. For example, the instructions may be stored as computer code on the computer-readable medium. In that regard, the terms "instructions" and "programs" may be used interchangeably herein. The instructions may be stored in object code format for direct processing by the processor, or in any other computer language including scripts or collections of independent source code modules that are interpreted on demand or compiled in advance. Functions, methods and routines of the instructions are explained in more detail below.

Data may be retrieved, stored or modified by processor **320** in accordance with the instructions. For instance, although the system and method is not limited by any particular data structure, the data may be stored in computer registers, in a relational database as a table having a plurality of different fields and records, XML documents or flat files. The data may also be formatted in any computer-readable format such as, but not limited to, binary values or Unicode. By further way of example only, image data may be stored as bitmaps comprised of grids of pixels that are stored in accordance with formats that are compressed or uncompressed, lossless (e.g., BMP) or lossy (e.g., JPEG), and bitmap or vector-based (e.g., SVG), as well as computer instructions for drawing graphics. The data may comprise any information sufficient to identify the relevant information, such as numbers, descriptive text, proprietary codes, references to data stored in other areas of the same memory or different memories (including other network locations) or information that is used by a function to calculate the relevant data.

The processor **320** may be any conventional processor, such as commercially available CPUS. Alternatively, the pro-

cessor may be a dedicated controller such as an ASIC or other hardware-based processor. Although FIG. **1** functionally illustrates the processor and memory as being within the same block, it will be understood by those of ordinary skill in the art that the processor and memory may actually comprise multiple processors and memories that may or may not be stored within the same physical housing. Accordingly, references to a processor or computer will be understood to include references to a collection of processors or computers or memories that may or may not operate in parallel.

The computer **310** may be at one node of a network and capable of directly and indirectly communicating with other nodes of the network. The network, and intervening nodes between computer **110** and other devices, may comprise various configurations and use various protocols including the Internet, World Wide Web, intranets, virtual private networks, local Ethernet networks, private networks using communication protocols proprietary to one or more companies, cellular and wireless networks (e.g., WiFi), instant messaging, HTTP and SMTP, and various combinations of the foregoing. Although only a few computers are depicted in FIGS. **1-2**, it should be appreciated that a typical system can include a large number of connected computers.

According to one implementation, the elements of the system **300** may be carried onboard a vehicle, such as an autonomous vehicle. In this regard, the input device **100** and display device **200** may be positioned in the cabin of the vehicle, such as at a center console. In the same way, the computer **310**, including the processor **320** and the memory **330**, may be stored at any location aboard the vehicle, and may be responsible for performing other tasks related to vehicle management.

FIG. **4** is a top view an input device **100** in conjunction with a display device **200**. The display device **200** may be positioned adjacent the input device **100**. By way of example, the display device **200** may positioned adjacent the input device **100** while including one or more layers or elements between display device **200** and the input device **100**. In one example, the input device **100** may be overlaid atop and/or secured to the display device **200** and the input device **100** may be clear or substantially transparent, i.e., while the input device **100** may absorb or alter light waves to some extent, the input device **100** is transparent enough to allow the graphics on the display to be distinctly seen by the user. For instance, the bottom surface **104** of the input device **100** may be secured to the display device **200** by any securing method, such as gluing, bonding, press-fit, or the like. The display device **200** may be any type of display, such as an LCD, plasma, LED-LCD, etc. In this regard, the surfaces of the input device **100** may be disposed at distances from the display device **200** corresponding to the heights h, h**1**, and h**2** described above. In one example, the display device **200** may be a projector and may project an image onto one or more surfaces of the display device. The display device **200** may display any combination of graphics or text that may be viewed by a user through the substantially transparent input device **100**. Additionally, the display device **200** may be aligned with the device **100** such that the graphics or text displayed by the display device **200** may be visible at one or more regions **110-150** of the device **100**.

As shown in FIG. **4**, the display device **200** may display any combination of graphics or text and may be visible when viewed from the top surface **102**. In this example, certain parameters relating to the audio function may be displayed at one of the display regions **150**. In other examples, the display region **150** may be divided into a plurality of sub-regions, and displayed information may relate to other functions, such as the operation of an autonomous vehicle, or any subcomponents thereof, climate control function, or navigation function. In this regard, the system **300** provides a reconfigurable user interface. For example, each of four different functions may be displayed simultaneously at each of four display sub-regions **150** and may be accessible. The different portions of the display device **200** may be used to display different graphical elements corresponding to the surface above it or the desired functions. The visual information shown by the display device **200** may correspond or not correspond with the different surfaces of the input device depending upon the needs of the system or selection of the user. For example, the portion of the display below one display sub-region **150** may correspond with the one feature whereas the portion below another display sub-region **150** may correspond with a different feature.

In the example where the input device **100** includes four display sub-regions, each of the four display sub-regions may correspond to a particular zone inside the cabin of a motor vehicle. For example, in the context of climate control, a user may view climate parameters for a driver at one display sub region, while the climate parameters for the front and rear passenger zones may each be accessible at one of the remaining display sub-regions.

As also shown in FIG. **4**, an icon may be displayed by the display device **200** at the function region **140**. In this example, the icon may take the form of a music note, indicating that it is associated with the audio function. Other icons and information helating to the various functions may also be displayed.

In operation, a user may view the one or more display regions **150** to see parameters associated with a particular function, such as any of the functions described above. Taking the audio function as an example, parameters relating to the audio function may be displayed at a display region **150**. Such parameters parameters may include, for example, track name, artist, album art, radio station information such as modulation (e.g., AM/FM, etc.) or broadcast frequency (e.g., 105.1 mHz), or volume. A user may wish to access the audio function in order to change one or more of the parameters associated with the audio function. Such changes may include, for example, adjusting the modulation (switch AM to FM, or vice versa), adjusting the broadcast frequency to a different radio station (105.1 mHz to 101.9 mHz), or increasing or decreasing the volume. In this scenario, a user may access the function at the function region **140** and subsequently adjust the parameters at one or both of the first and second adjustment regions **110** or **120**, as will be explained below.

As noted above, a user may input commands, etc. using various gestures. In one example, shown in FIG. **5**, a user may provide a continuous gesture from the function region **140** to the connector region **130**, as shown by the arrow A. The continuous gesture may be, for example, a swipe extending from the function region **140** to a portion of the connector region **130** adjacent the second adjustment region **120**. The gesture may be provided to the input surface **145** and the input surface **134**. During this gesture, the icon displayed by the display device **200** and visible in the function region **140** may track the input gesture in the connector region **130** as the gesture is inputted therethrough. Once the gesture has reached a predetermined position within the connector channel **130**, certain parameters may be displayed and are accessible at the first and second adjustment regions **110-120**. In this regard, a user may access and adjust the parameters associated with the function region at either of the first adjustment region **110** or second adjustment region **120**. For example, a user may change the volume by delivering an input

to the second adjustment region **120** in the form of a circular swipe, as shown by the arrow B. In this way, a clockwise swipe may yield an increase in volume, while a counter-clockwise swipe may decrease the volume. In one example, a single-finger circular swipe may be differentiated from a multi-fingered circular swipe by the system **300**. In this regard, a multi-fingered swipe entered at the second adjustment region **120** may be processed as a different command or operation than a single-fingered swipe at the second adjustment region **120**. A user may also adjust audio settings via the first adjustment region **110**. In this way, a horizontal swipe, as shown by arrow C, may allow a user to adjust broadcast frequency in order to change radio stations, while a vertical swipe, as shown by arrow D, may change between AM/FM, etc.

If no user input is received at the first or second adjustment regions **110**, **120** for a predetermined amount of time, the system **300** may return to a home state. In the home state, a user may not access the parameters at the first or second adjustment regions **110**, **120**, and may have to provide additional input to the connector region and/or function region in order to access the desired parameters. In another example, a user may provide a gesture input to the connector region in order to return to the home state. In yet another example, a user may provide gesture input to a second connector region. In this regard, the first parameters displayed at the first and second adjustment regions **110** and **120** may be replaced with parameters associated with the second connector region.

In one example, the input device **100** may accommodate access to more than four functions. In this example, the input device **100** may include a function selector region. The function selector region may be disposed at a periphery of the input device **100** near one of the sides **106** or **108**. The function selector region may extend longitudinally between two opposing sides, e.g., sides **106** and **108**. The function selector region may include an input surface to that of the connector region **130** and may similarly be recessed within the input device **100**. In operation, a user may deliver gesture input to the function selector region in the form of a swipe. The gesture input may cause different functions to be displayed at the display sub-regions **150**, allowing a user to access different functions.

According to another implementation, the input device **100** may include one or more movable surfaces or regions. For example, the input device **100** may include one or more buttons that may be pressed by a user. In one example, the first adjustment region **110** may be movable from a first position to a second position in a direction perpendicular to the top and bottom surfaces **102** and **104**. In this example, a user may modify any of the settings or parameters associated with a particular function by pressing or pulling the first adjustment region **110** to and/or from the first and second positions. In another example, such button may toggle power as an on/off switch.

According to another implementation, the first adjustment region **110**, the second adjustment region **120**, the connector region **130**, and the function region **140** are all co-planar with respect to the top surface **102**. In this regard, each of the regions **110-140** have a height h. In this implementation, each of the regions **110-140** may have other characteristics which may allow for tactile distinction among the regions **110-140**. For example, certain regions may be formed of a plastic while other regions may be formed of a glass. In this example, the plastic and the glass may have different surface textures, allowing a user to differentiate different regions by virtue of the different textures. In another example, one or more overlays may be placed atop the top surface **102**, with each of the overlays corresponding to a particular region. In this example, the each of the overlays may have a different texture, allowing a user to differentiate the regions. The overlays may be, for example, a stencil that is glued or otherwise bonded to the top surface **102**. In another example, the overlays may be bonded directly to the display device.

In another implementation, the input device **100** may detect a user's input by methods other than the touch sensing methods described above. For example, a multi-camera array may detect the movements of a user's hand. In this regard, the device **100** may not be touch sensitive. Instead, the multi-camera array may detect and distinguish the movements of a user's hand among the various regions of the device **100**. In one alternative, multiple cameras, stereo vision, or other 3D imaging technologies, such as structured light emission, may be used to detect user input. In yet another implementation, an array of infrared (IR) emitters may be arranged at the periphery of the device **100**, e.g, near the sides **106** and **108**. In this example, the IR emitters may detect and distinguish the movements of a user's hand among the various regions of the device **100**.

It will be further understood that the sample values, types and configurations of data shown in the figures are for the purposes of illustration only. In that regard, systems and methods in accordance with the present invention may include different data values, types and configurations, and may be provided and received at different times (e.g., via different web pages) and by different entities (e.g., some values may be pre-suggested or provided from different sources).

As these and other variations and combinations of the features discussed above can be utilized without departing from the invention as defined by the claims, the foregoing description of the embodiments should be taken by way of illustration rather than by way of limitation of the invention as defined by the claims. It will also be understood that the provision of examples of the invention (as well as clauses phrased as "such as," "e.g.", "including" and the like) should not be interpreted as limiting the invention to the specific examples; rather, the examples are intended to illustrate only some of many possible aspects.

The invention claimed is:

1. A system, comprising:

a user input device comprising:

a first input surface configured to receive user input, the first input surface disposed on a first side of the user input device;

a second input surface configured to receive user input, the second input surface disposed on the first side of the user input device; and

a display device disposed adjacent a second side of the user input device, the display device being disposed at a fixed first distance from the first input surface and at a fixed second distance from the second input surface, with the first distance being different from the second distance; and

a display surface disposed on the first side of the user input device, configured to display a graphic, the display surface being entirely disposed a fixed third distance from the display device, the third distance being between the first and second distance.

2. The system of claim **1**, wherein the user input device is translucent.

3. The system of claim **1**, the user input device further comprising a third input surface configured to receive user input, the third input surface disposed on the first side of the

user input device and being disposed at a distance from the display device equal to the second distance.

4. The system of claim **3**, wherein the third input surface further comprises a plurality of third input surfaces.

5. The system of claim **1**, wherein the first input surface is circular.

6. The system of claim **5**, wherein the first input surface is convex with respect to the second side.

7. The system of claim **5**, wherein the first input surface is configured to receive at least one of a horizontal swipe, vertical swipe and tap.

8. The system of claim **1**, wherein the second input is a circular ring.

9. The system of claim **8**, wherein the second input surface surrounds the first input surface.

10. The system of claim **8**, wherein the second input is recessed with respect to the first side of the user input device.

11. A user input device having a first side and a second side, comprising:

a first input surface configured to receive user input, the first input surface disposed on the first side and having a fixed first height with respect to the second side;

a second input surface configured to receive user input, the second input surface disposed on the first side of the user input device and having a fixed second height with respect to the second side;

a display surface disposed on the first side of the user input device configured to display a graphic, the display surface entirely disposed at a fixed third height with respect to the second side that is less than the first height and greater than the second height.

12. The user input device of claim **11**, further comprising a third input surface configured to receive a third user input, the third input surface disposed on the first side of the user input device and having a fourth height with respect to the second side that is equal to the second input surface.

13. The user input device of claim **12**, wherein the third input surface further comprises a plurality of third input surfaces.

14. The user input device of claim **11**, wherein the first input surface is circular.

15. The user input device of claim **14**, wherein the first input surface is convex with respect to the second side.

16. The user input device of claim **14**, wherein the first input surface is configured to receive a horizontal swipe, vertical swipe or tap.

17. The user input device of claim **11**, wherein the second input is a circular ring.

18. The user input device of claim **17**, wherein the second input surface surrounds the first input surface.

19. The user input device of claim **17**, wherein the second input is recessed with respect to the first side of the input device.

20. A method of receiving input, comprising:

receiving a first user input at a first input surface, the first input surface being disposed on a first side of a user input device and having a fixed first height with respect to a second side of the user input device;

receiving a second user input at a second input surface, the second user input being disposed on the first side of the user input device and having a fixed second height with respect to the second side of the user input device, the second height being less than the first height; and

displaying, on a display surface disposed on the first side of the user input device, a graphic;

wherein the display surface is entirely disposed at a fixed third height with respect to the second side that is less than the first height and greater than the second height.

21. The method of claim **20**, wherein the first user input comprises at least one of a horizontal swipe, a vertical swipe, or a tap.

22. The method of claim **20**, wherein the second user input comprises a circular swipe.

23. A system comprising:

a display;

a translucent input device overlaying the display;

the input device comprising a surface and an output, the output providing signals indicative of a location at which the surface was touched and the surface comprising:

a first touch sensitive portion disposed a fixed first distance from the display,

a second touch sensitive portion disposed a fixed second distance from the display, the second distance being farther from the display than the first touch sensitive portion, and

a transition portion disposed between the first touch sensitive portion and the second touch sensitive portion, the transition portion being configured to be perceptibly distinguishable, based on human touch, from the first and second touch sensitive portions; and

a display surface configured to display a graphic, the display surface entirely disposed a fixed third distance from the display, the third distance being shorter than the second distance and greater than the first distance.

24. The system of claim **23**, further comprising a processor, a memory accessible by the processor and instructions stored in the memory and accessible by the processor, wherein the instructions include: displaying on the display a first visual feature corresponding with a first function at a location corresponding with the first touch sensitive portion, displaying on the display a second visual feature corresponding with a different function at a location corresponding with the second touch sensitive portion, and performing the first function when the output indicates that the first touch sensitive portion was touched and the second function when the output indicates that the second touch sensitive portion was touched.

25. The system of claim **23**, wherein a shape of the transition portion relative to the plane is a curve.

26. The system of claim **25**, wherein the shape is a circle.

27. The system of claim **23**, wherein a cross section of a transition portion, relative to a plane orthogonal to the plane of display edges, is at least partially curved.

28. The system of claim **23**, wherein the input device is configured to output data indicative of a swipe gesture, wherein the first touch sensitive portion is configured to receive a swipe gesture without touching the second touch sensitive portion, and wherein the second touch sensitive portion is configured to receive a swipe gesture without touching the first touch sensitive portion.

29. The system of claim **23** wherein the transition portion is touch sensitive and the output indicates when the transition portion was touched.

* * * * *